



EXPEDITED PROCEDURE - EXAMINING GROUP 2815

8/Response (N.B.)
J. Steptoe
10-17-01

09/259,762

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Zhiping Yin et al.	Examiner:	Jose Diaz
Serial No.:	09/259,762	Group Art Unit:	2815
Filed:	March 1, 1999	Docket:	303.531US1
Title:	OXYGEN PLASMA TREATMENT FOR NITRIDE SURFACE TO REDUCE PHOTO FOOTING		

RESPONSE UNDER 37 C.F.R. § 1.116

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Commissioner for Patents
Washington, D.C. 20231

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Applicant has carefully reviewed and considered the Office Action mailed on August 2, 2001, and the references cited therewith.

No claims are amended; as a result, claims 1-3 and 5-11 are pending in this application.

§103 Rejection of the Claims

Claims 1-3 and 5-11 were rejected under 35 USC § 103(a) as being unpatentable over Lin et al (U.S. Patent No. 6,143,666) in view of Puntambekar et al (U.S. Patent No. 5,714,037).

The Lin patent describes methods for enhancing adhesion of a photoresist layer to a dielectric layer. That is why the patent addresses treating a silicon oxide surface and not a silicon nitride surface. Toward that end, the Lin patent describes treating a silicon oxide layer with very high flow rates of oxygen, i.e. 400 to 8000 sccm. These flowrates are many times greater than either what is claimed or what is described as preferable or acceptable in the Puntambekar et al. reference. The Puntambekar et al. reference describes a treatment for roughening and hardening a silicon nitride film. The method includes treating the film with an argon:oxygen mixture, "which preferably has a high ratio of argon to oxygen," (col. 6, line 46). The oxygen rate described was 0.5 to 15 sccm. The argon flow rate ranged from 5 to 500 sccm. These values were selected in order to "remove a slight portion of the top surface of the photoresist layer 20, while simultaneously the argon ions roughen the upper surface of the photoresist layer." There is no suggestion that flowrates as high as 8000 sccm oxygen would be acceptable. We have only the Examiner's unsupported belief that it would work.

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In the method of the present invention, the oxygen rate is at least about 300 sccm, which is 20 times higher than anything contemplated or preferred in the Puntambekar et al. reference. This treatment step is part of a process for reducing profile distortion in semiconductor fabrication. This treatment is different from the treatment described in the Lin patent which is for increasing adhesion of a silicon oxide layer. The oxygen flowrate described in the present invention is so far out of the range described as "preferred" in the Puntambekar et al. reference that the Puntambekar et al. reference teaches away from using it. The Puntambekar et al. reference provides no suggestion that an oxygen flowrate of at least about 300 sccm would be desirable, and therefore, does not render the claims 1-3 and 5-11 obvious.

The Examiner characterizes Puntambekar as "adding an inert gas to the oxygen gas." However, what Puntambekar describes is an argon flow rate that is much greater than the oxygen flow rate. Furthermore, the argon gas is used in the Puntambekar reference to roughen a surface.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at (612) 373-6976 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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By their Representatives,

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Box AF, Commissioner of Patents, Washington, D.C. 20231, on this 2 day of October, 2001.

Name

Tina Pugh

Signature

Z-ly

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